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EXAMINER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
Office Action Summary	10/522,027	SUGENO ET AL.
	Examiner	Art Unit	
	Mia M. Thomas	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>25 June 2008</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-4,6-8,10 and 11</u> is/are pending in the application.

   4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-4 and 6-8, 10, 11</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>25 June 2008</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

   Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a)☒ All   b)☐ Some * c)☐ None of:

   1.☒ Certified copies of the priority documents have been received.

   2.☐ Certified copies of the priority documents have been received in Application No. _____.

   3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

   * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
      Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
      Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1.   A request for continued examination under 37 CFR 1.114, including the fee set forth in

37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible

for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has

been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37

CFR 1.114. Applicant's submission filed on 25 June 2008 has been entered.

Response to Amendment

2.   This Office Action is made responsive to applicant's remarks received on 25 June 2008.

Claim 1 has been amended, and claims 5 and 9 cancelled. Accordingly claims 1-4, 6-8, 10 and

11 remain pending in the application. Claim 1 is independent. Applicant's arguments filed 25

June 2008 have been fully considered and a complete response to those remarks is provided

below.

Priority

3.   Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers

have been placed of record in the file.

Claim Rejections - 35 USC § 101

4.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of
> matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the
> conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject
Matter Eligibility" (Official Gazette notice of 22 November 2005), Section IV.C, reads as
follows:

While abstract ideas, natural phenomena, and laws of nature are not eligible for patenting, methods and products employing abstract ideas, natural phenomena, and laws of nature to perform a real-world function may well be. In evaluating whether a claim meets the requirements of section 101, the claim must be considered as a whole to determine whether it is for a particular application of an abstract idea, natural phenomenon, or law of nature, rather than for the abstract idea, natural phenomenon, or law of nature itself.

For claims including such excluded subject matter to be eligible, the claim must be for a practical application of the abstract idea, law of nature, or natural phenomenon. Diehr, 450 U.S. at 187, 209 USPQ at 8 ("application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection."); Benson, 409 U.S. at 71, 175 USPQ at 676 (rejecting formula claim because it "has no substantial practical application").

To satisfy section 101 requirements, the claim must be for a practical application of the Sec. 101 judicial exception, which can be identified in various ways:

> The claimed invention "transforms" an article or physical object to a different state or thing.

> The claimed invention otherwise produces a useful, concrete and tangible result, based on the factors discussed below.

5.   Claims 1-4, 6-8, 10, 11 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows.   Claims 1-4, 6-8, 10, 11 recites the mere manipulation of data or an abstract idea, or merely solves a mathematical problem without a limitation to a practical application.   A practical application exists if the *result* of the claimed invention is "useful, concrete and tangible" (with the emphasis on "result")(Guidelines, section IV.C.2.b).   A "useful" result is one that satisfies the utility requirement of section 101, a "concrete" result is one that is "repeatable" or "predictable", and a "tangible" result is one that is "real", or "real-world", as opposed to "abstract" (Guidelines, section IV.C.2.b)).   Claims 1-4, 6-8, 10, 11 merely manipulates data without ever producing a useful, concrete and tangible result. For example, at claim 1, there is simply software to be manipulated by an image processing device. The recitation of "software" not residing on a computer readable medium is thus non-statutory. After the steps of "recursive filtering", "low-frequency compression" and "arithmetic" (mathematical functions), there are no results of these aforementioned steps. There is no "physical transformation" claimed in independent claim 1. Applicant is also advised to provide a

written explanation of how and why the claimed invention (either as currently recited or as amended) produces a useful, concrete and tangible result.

In order to for the claimed product to produce a "useful, concrete and tangible" result, recitation of one or more of the following elements is suggested:

- The manipulation of data that represents a physical object or activity transformed from outside the computer.

- A physical transformations outside the computer, for example in the form of pre or post computer processing activity.

- A direct recitation of a practical application;

Appropriate correction is required.

Claim Rejections - 35 USC § 112

6.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7.   Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

8.   For example, at lines 10-13 of Claim 1, the applicant is intending to further clarify the "arithmetic means for compressing the low-frequency components..." by way of an amendment. However, specifically at lines 11-13, the Examiner is unclear as to how the arithmetic means calculates/manipulates the "unsharpened image" along with the "input image". For clarity, at page 4, lines 19-24, the applicant states that "the arithmetic means 122, subtracts, from image

data f(t) stored in the line memory 12, image data g(t-1) stored in the line memory 128 at the corresponding address one-line before, thereby obtains a difference value d and outputs the difference value d to the LUT 124." In response to the currently amended claim 1, it is noted that the features upon which applicant relies (i.e., see page 4, lines 19-page 5, line 2) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Further clarification of "the input image" at line 10 and "an input image" at line 11 of claim 1 is also required. The Examiner is unclear how you can subtract "an input image" from an "unsharpened image" before "the input image" while using an "output image" of the low-frequency compression components. Is the "input image" output first and then subtracted from the "unsharpened image?" Appropriate clarification is required for proper claim interpretation and claim clarity.

Claim Rejections - 35 USC § 103

9.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10.   Claims 1-2, 4, 7, 8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Makram-Ebeid (US 6,466,700 B1) in combination with Florent (US 6,151,417) and Young (US 2002/0181797 A1).

Regarding Claim 1: (Currently Amended) **As best understood by the Examiner**, Makram-Ebeid teaches an image processing device (Refer to Figure 9; "The invention relates to an image processing method for preserving the edges of objects reproduced in an intensity image and for reducing the noise..." at abstract), comprising:

recursive filtering means for smoothing an input image("...and passage at each point of a recursive spatial filter having an anisotropic kernel and providing a degree of smoothing which is greater in the direction perpendicular to the direction to the gradient than in the direction of the intensity gradient." at abstract); the recursive filtering means including edge setting means for setting at least one edge having a predetermined angle from a scanning line direction of the input image (Refer to Figure 2, wherein Makram-Ebeid teaches that the method of recursive filtering as applied to a predetermined angle as shown at Figures 4a-4b; further refer to column 2, lines 29-42) and control means for smoothing the image to be smoothed in correspondence with the edge set by the edge setting means (Refer to column 13, lines 1-27; "An advantage of the method according to the invention resides in the fact that it is recursive, so that it can be carried out very economically in respect of calculations because each application of the filter to a point utilizes calculation elements which have already been performed." at column 1 lines 66-column 2, line 19;),

Florent teaches low-frequency component compression means (Refer to Figure 3a, numeral 24) for setting an amount of compression of low-frequency components of the input image according to an output of the recursive filtering means (Refer to Figure 3a, numeral 27-"Lookup Table"; "...two-dimensional spatial filtering means (F(2D)) which are applied to said difference image in order to enhance spatially coherent samples and to supply a measure of probability of

motion (beta(t)) which is linked to said spatially coherent samples,…means for applying a scalar function (f(1)) to said measure of probability of motion (beta(t)) to supply an output coefficient (alpha(t)) and…means for generating said recursion factor (K(t)) in dependence on said output coefficient (alpha(t))." at column 7, line 16).

Young teaches arithmetic means for compressing the low-frequency components of the input image by subtracting an input image which is input frame-by-frame from an original unsharpened image of at a corresponding address one line before the input image using an output of the low-frequency component compression means (Refer to paragraph [0008, 0009, 0021, 0048, 0051]).

Makram-Ebeid, Florent and Young are combinable because they are all in the same field of adaptive and recursive filtering, specifically in biomedical applications.

At the time that the invention was made, it would have been obvious to one of ordinary skill in the art to combine these claimed elements by known methods with no change in their respective functions, and the combination of these claimed elements would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Further, the combination of these claimed elements would allow the user to more efficiently process images while preserving the edges of objects reproduced by the image processing device of this invention.

The suggestion/motivation for combining the teachings of Makram-Ebeid and Florent would have been "this apparatus offers the advantage that it supplies better images, particularly in the case where the illumination intensity of the object whose image is formed is low; it nevertheless enables an operator to track very small objects in motion accurately during display of the sequence of images." at column 2, lines 32-38, Florent.

By combining the teachings of Young with regards to the arithmetic means for manipulating the combination of the teachings of Makram-Ebeid and Florent would have been "for presenting image details in a digital image, and more particularly to a method for presenting diagnostically important image details in digital mammography." at paragraph [0001], Young.

The filtering allows the device to reduce the noise in the images and also produces a kernel for scanning in any particular direction which allows the user to extend the field of view of the image at a given point.

All these claimed elements as stated and rejected above were known in the prior art and one skilled in the art could have combined the teachings of Makram-Ebeid, Florent and Young to obtain the claimed invention as set forth at claim 1.

Regarding Claim 2: (Original) Makram-Ebeid teaches display means of displaying the input image (Refer to Figure 9, numeral 7, further at column 13, lines 10-27) and region of interest setting means of setting a region of interest in the input image displayed in the display means, wherein the edge setting means sets the edge on the basis of the region of interest set by the region of interest setting means (Refer to column 3, lines 66-column 4, line 14).

Regarding Claim 4: (Original) Florent teaches wherein the low-frequency component compression means (Refer to Figure 3a, numeral 24) has lookup table means (Refer to Figure 3a, numeral 27-"Lookup Table") supplied with an output value from the recursive filtering means and converting the output value into a value obtained by multiplying the output value by a predetermined coefficient("In addition to this, by heightening the smoothing effect in, for instance, the dark region and/or the bright region of image, the look-up table 11 enables to control also the smoothing effect in accordance with the pixel value, such as increasing the degree of enhancement by the image enhancement processing on the succeeding stages." at column 3, line 27; "...two-dimensional spatial filtering means (F(2D)) which are applied to said difference image in order to enhance spatially coherent samples and to supply a measure of probability of motion (beta(t)) which is linked to said spatially coherent samples,...means for applying a scalar function (f(1)) to said measure of probability of motion (beta(t)) to supply an output coefficient (alpha(t)) and...means for generating said recursion factor (K(t)) in dependence on said output coefficient (alpha(t))." at column 7, line 16).

Regarding Claim 5: (Canceled).

Regarding Claim 7: (Original) Makram-Ebeid discloses wherein the recursive filtering means separately generate smoothed images with respect to edges in direction at 45° from the scanning line direction of the input image (left- downward direction) (Refer to Figure 3b, specifically where S =(square root of 2)), a direction at 90° from the scanning line direction (downward direction) (Refer to Figure 3b, specifically where S =1) and a direction at 135° from the scanning line direction (right-downward direction) (Refer to Figure 3b, specifically where S= (square root of 3)).

Regarding Claim 8: (Original) Florent teaches wherein weighting averaging is performed on the

smoothed images separately generated with respect to the edges by the recursive filtering

means ("The dimension of the supports of the sub-filters is W2 along the axes QZ1, . . . , QZN

and W1 in the direction perpendicular to said axes, where W2>W1. For example, W1 equals 1

or 2 pixels and W2 equals from 5 to 10 pixels. The sub-filters form mean values with

coefficients which are constant or decrease from the extreme point Q(t) (x,y). For example, N=8

directions suffice. At the point Q(t) (x,y) the sub-filters calculate a number N (for example, 8) of

mean values which are referenced M(1) (Q), M(2) (Q), . . . , M(8)(Q)." at column 5, line 3).

Regarding Claim 9: (Canceled).

Regarding Claim 11: (Original) Florent discloses wherein the recursive filtering means (Refer to

Figure 7, numeral 50) comprises:

a first line memory in which one line of the input image is stored (Refer to Figure 1b, numeral

15);

a second line memory in which line data before storage in the first line memory is stored (Refer

to Figure 3b, numeral 26, specifically with the directional's of K(t) and K(t-1));

an arithmetic device which subtracts the line data stored in the first line memory from the line

data stored in the second line memory ("In a version 120 the recursion factor K(t) is calculated

in a simple manner, in the block 25, by way of a first function which is written as (note equation

6(a)), further reference lines 6-15, column 6);

lookup table means of converting the difference value obtained by subtraction performed by the

arithmetic device into a value obtained by multiplying the difference value by a filter coefficient

(Refer to Figure 3a, numeral 27-"Look-Up Table"); and

an adder which adds together the value converted by the lookup table means as a result of

multiplication by the filter coefficient and the line data stored in the second line memory (Refer

to Figures 3a and 3b, numeral 22).

11.   Claims 3, 6 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Makram-Ebeid (US 6,466,700 B1) in combination with Florent (US 6,151,417) and Young (US

2002/0181797 A1) and further in view of Tsuchiya et al. (US 6,724,943 B2).

Regarding Claim 3: (Original) Makram-Ebeid in combination with Florent and Young teaches

all the claimed elements as rejected above. However, Tsuchiya more clearly exemplifies and

teaches low-frequency component compression means (Refer to Figure 2, numeral 10) of

setting an amount of compression by which low-frequency components of the input image are

compressed according to the smoothed image generated by the recursive filtering means

(Further refer to Figure 2, numerals 12a-12n, 13 and 35), wherein the control means changes

an output from the recursive filtering means on the basis of the compression amount set by the

low-frequency component compression means ("In addition to this, by heightening the

smoothing effect in, for instance, the dark region and/or the bright region of image, the look-up

table 11 enables to control also the smoothing effect in accordance with the pixel value, such as

increasing the degree of enhancement by the image enhancement processing on the

succeeding stages." at column 3, line 27).

Makram-Ebeid, Florent, Young and Tsuchiya are combinable because they are all in the same

field of adaptive and recursive filtering, specifically in biomedical applications.

At the time that the invention was made, it would have been obvious to one of ordinary skill in the art to combine these claimed elements by known methods with no change in their respective functions, and the combination of these claimed elements would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Further, the combination of these claimed elements would allow the user to more efficiently process images while preserving the edges of objects reproduced by the image processing device of this invention.

The motivation/suggestion for combining the teachings of Tsuchiya with the combination of Makram-Ebeid, Florent and Young would have been "Therefore, it is possible to enhance the signal level of the small-amplitude components other than the edge components while conserving the edge components out of the input image data S1, in this way, it is possible to improve the contrast of the whole image while maintaining the dynamic range of the image, and also possible to improve the sharpness of the image at also the vicinity of the edge. By this, the video camera 1 is able to capture sharp images wherein the dynamic range and the contrast are secured, even if the shooting is performed in a fog or even the case of a vague distant view, and also able to perform high-grade image enhancement processing." at column 7, line 9 (Tsuchiya).

All these claimed elements as stated and rejected above were known in the prior art and one skilled in the art could have combined the teachings of Makram-Ebeid, Florent, Young and Tsuchiya to obtain the claimed invention as set forth at claim 3.

Regarding Claim 6: (Original) Tsuchiya discloses wherein the recursive filtering means performs processing expressed by g(t) = k*f(t) + (1 - k)-g(t - 1) where g(t) is the output from the recursive filtering means (The nonlinear smoother 5 extracts the edge components, the pixel values of which change abruptly, out of this input image data S1, and outputs the edge components as it is without smoothing it, while smoothes the small-amplitude components other than the edge components, and hereby smoothes the input image data S1, conserving the edge components of the input image data S1." at column 2, line 58).

k is a filter coefficient (Refer to Figure 2, numeral 12a-"epsilon filter"),

f(t) is the input image ("input image data S1"),

1 - k is a feedback rate (Refer to Figure 3, additionally, refer to Figure 14, for illustrations of multiple feedback responses at different rates throughout.)

and g(t - 1) is the output from the recursive filtering means one-line before, and changes the feedback rate (I-k) on the basis of the magnitude of the difference (d) between the input image (f(t)) and the output value (g(t - 1))of the recursive filtering means one-line before ("The epsilon-filter 12A, which is a nonlinear smoothing filter,... it smoothes the image data S3,... and then sends the resulted smoothed image data S4A to an epsilon-filter 12B. In the case where the pixel for filter processing is one-dimensional and 2N+1 tap, the smoothing processing at this epsilon-filter 12A is represented with the following equation (Refer to equation 1). That is, the epsilon-filter 12A compares the absolute value absolute value of x(n) –x(n-k). of the difference between the pixel value x(n) of a central pixel p(n) and the pixel value x(n-k) of a pixel p(n-k) of filter processing with the stated threshold value epsilon." at column 3, line 34) For further clarity, the multiple mathematical manipulations of these equations are found at column 3, lines 58-column 5, line 67).

Regarding Claim 10: (Original) Tsuchiya discloses delay means of delaying the input image with respect to time processing (Refer to Figure 1, numeral 4-"Delay Circuit") performed by the processing means including the recursive filtering means (Refer to Figure 1, numeral 3-"Image Processing Circuit"), wherein the input image delayed by the delay means is input as the original of the image input to the arithmetic means (Refer to Figure 1, numerals S15-S17; additionally, the input image to be delayed is S1).

Response to Arguments

12.   Applicant's arguments, see page 6, with respect to 35 U.S.C. 112, Second Paragraph Rejections have been fully considered and are persuasive. The rejection of claim 1 has been withdrawn.

Summary of Remarks:

A.   Rejections 35 U.S.C. 103-At page 7-10, Applicant's respectfully disagrees with the rejection based upon Makram-Ebeid in view of Florent and further in view of Tsuchiya. "The Office Action alleges that Makram-Ebeid discloses various features of the claimed invention. Makram-Ebeid is completely silent on performing the smoothing process in parallel with line-by-line scanning of the image, as now recited in independent claim 1. Furthermore, Florent and Tsuchiya also appears to be silent on this particular feature. Claim 1 is allowable over the art of record. Claims 2-4, 6-8, 10 and 11 depend from independent Claim 1, and are therefore believed allowable for at least the reasons set forth with respect to independent Claim 1.

Examiner's Response:

B.   Applicant's arguments with respect to claims 1-11 have been considered but are moot in

view of the new ground(s) of rejection.

Conclusion

13.   The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure.

US 2002/0035407 A1   US 6,511,426 B1   US 5,757,362 A

Any inquiry concerning this communication or earlier communications from the examiner

should be directed to Mia M. Thomas whose telephone number is (571)270-1583.   The

examiner can normally be reached on Monday-Thursday 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Vikkram Bali can be reached on 571-272-7415.   The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mia M Thomas/
Examiner, Art Unit 2624

/Vikkram Bali/

Supervisory Patent Examiner, Art Unit 2624/Vikkram Bali/

Supervisory Patent Examiner, Art Unit 2624